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| FORM PTO-1390 (REV 5-93) | | U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE | | ATTORNEY'S DOCKET NUMBER 3036/50648 | |
| TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING FILING UNDER 35 U.S.C. 371 | | | | | |
| INTERNATIONAL APPLICATION NO. PCT/GB00/02394 | | INTERNATIONAL FILING DATE 19 June 2000 (19.06.2000) | | PRIORITY DATE CLAIMED 25 June 1999 (25.06.1999) | |
| TITLE OF INVENTION: IMPROVEMENTS IN OR RELATING TO MOBILE TELECOMMUNICATIONS SYSTEM | | | | | |
| APPLICANT(S) FOR DO/EO/US: Stephen William WALES | | | | | |
| Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information: | | | | | |
| 1. | <input checked="" type="checkbox"/> | This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. | | | |
| 2. | <input type="checkbox"/> | This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371 | | | |
| 3. | <input type="checkbox"/> | This express request to begin national examination procedures (35 U.S.C. 371(f) at any time rather than delay Examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). | | | |
| 4. | <input checked="" type="checkbox"/> | A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. | | | |
| 5. | <input checked="" type="checkbox"/> | A copy of the International Application as filed (35 U.S.C. 371(c)(2)). | | | |
| | <input checked="" type="checkbox"/> | a. is transmitted herewith (required only if not transmitted by the International Bureau). | | | |
| | <input type="checkbox"/> | b. has been transmitted by the International Bureau | | | |
| | <input type="checkbox"/> | c. is not required, as the application was filed in the United States Receiving Office (RO/US) | | | |
| 6. | <input type="checkbox"/> | A translation of the International Application into English (35 U.S.C. 371(c)(2)). | | | |
| 7. | <input type="checkbox"/> | Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) | | | |
| | <input type="checkbox"/> | a. are transmitted herewith (required only if not transmitted by the International Bureau). | | | |
| | <input type="checkbox"/> | b. have been transmitted by the International Bureau. | | | |
| | <input type="checkbox"/> | c. have not been made; however, the time limit for making such amendments has NOT expired | | | |
| | <input type="checkbox"/> | d. have not been made and will not be made. | | | |
| 8. | <input type="checkbox"/> | A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). | | | |
| 9. | <input checked="" type="checkbox"/> | An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)) (Unexecuted - 2 pages) | | | |
| 10. | <input checked="" type="checkbox"/> | A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). | | | |
| Item 11. to 16. below concern other document(s) or information included: | | | | | |
| 11. | <input type="checkbox"/> | An Information Disclosure Statement under 37 CFR 1.97 and 1.98. | | | |
| 12. | <input type="checkbox"/> | An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. | | | |
| 13. | <input checked="" type="checkbox"/> | A FIRST preliminary amendment. | | | |
| | <input type="checkbox"/> | A SECOND or SUBSEQUENT preliminary amendment. | | | |
| 14. | <input type="checkbox"/> | A substitute specification and marked-up copy thereof. | | | |
| 15. | <input type="checkbox"/> | A change of power of attorney and/or address letter. | | | |
| 16. | <input type="checkbox"/> | Other items or information: | | | |
| | <input type="checkbox"/> | a. Three (3) sheets of drawings showing Figures 1, 2, 3 | | | |
| | <input type="checkbox"/> | b. First page of published International Application | | | |

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|--|--------------|--|------------|---|--------------|
| U.S. APPLICATION NO. (if known, see 37 CFR 1.5) | | INTERNATIONAL APPLICATION NO. PCT/GB99/02394 | | ATTORNEY'S DOCKET NUMBER 3036/50648 | |
| 17. <input checked="" type="checkbox"/> The following fees are submitted: | | | | CALCULATIONS | PTO USE ONLY |
| Basic National Fee (37 CFR 1.492(a)(1)-(5)): | | | | \$890.00 | |
| Search Report has been prepared by the EPO or IPO \$ 890.00 | | | | | |
| International preliminary examination fee paid to USPTO (37 CFR 1.482) \$ 690.00 | | | | | |
| No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$ 740.00 | | | | | |
| Neither international preliminary examination fee (37 CFR 1.482) nor International search fee (37 CFR 1.445(a)(2)) paid to USPTO \$ 1000.00 | | | | | |
| International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$ 100.00 | | | | | |
| ENTER APPROPRIATE BASIC FEE AMOUNT = | | | | \$ 890.00 | |
| Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)). | | | | \$130.00 | |
| Claims | Number Filed | Number Extra | Rate | | |
| Total Claims | 10-20 = | | X \$18.00 | \$ | |
| Independent Claims | 2-3 = | | X \$84.00 | \$ | |
| Multiple dependent claims(s) (if applicable) | | | + \$280.00 | \$ | |
| TOTAL OF ABOVE CALCULATIONS= | | | | \$130.00 | |
| Applicant claims Small Entity Status (See 37 CFR §1.27) <input type="checkbox"/> yes <input type="checkbox"/> no. Reduction by 1/2 for filing by small entity, if applicable. | | | | \$ | |
| SUBTOTAL = | | | | \$1,020.00 | |
| Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)). | | | | \$ | |
| TOTAL NATIONAL FEE = | | | | \$1,020.00 | |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28,3.31). \$40.00 per property + | | | | \$ | |
| TOTAL FEE ENCLOSED = | | | | \$1,020.00 | |
| | | | | Amount to be: refunded | \$ |
| | | | | Charged | \$ |
| a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>1,020.00</u> for the above filing fees is enclosed | | | | | |
| b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. | | | | | |
| c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees, which may be required, or credit any overpayment to Deposit Account No. <u>05-1323</u> . (Attorney Docket No. <u>3036/50648</u> .) A duplicate copy of this sheet is enclosed. | | | | | |
| NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status. | | | | | |
| SEND ALL CORRESPONDENCE TO: | | | |  | |
| Crowell & Moring, L.L.P. | | | | SIGNATURE | |
| Intellectual Property Group | | | | Gary R. Edwards | |
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| Fax No. (202) 628-8844 | | | | 14 December 2001 | |
| | | | | DATE | |

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PTO/PCT Rec'd 14 DEC 2001Attorney Docket: 3036/50648
PATENT**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant: STEPHEN WALES
Serial No.: NOT YET ASSIGNED PCT No.: PCT/GB00/02394
Filed: DECEMBER 14, 2001
Title: METHOD OF ASSOCIATING A TRAINING CODE TO A
CHANNELISATION CODE IN A MOBILE
TELECOMMUNICATION SYSTEM

PRELIMINARY AMENDMENT

Box PCT
Commissioner for Patents
Washington, D.C. 20231

December 14, 2001

Sir:

Please enter the following amendments to the claims, as amended by way of Annexes to the International Preliminary Examination Report for PCT/GB00/02394, prior to the examination of the application during the U.S. National Phase.

IN THE CLAIMS:

Please amend the claims as follows: (A copy of a marked up version with markings to show changes made is attached hereto.)

5. (Amended) A Code-Division Multiple Access mobile telecommunication system operable in accordance with the method as claimed in Claim 1.

6. (Amended) A code-Time Division Multiple Access mobile telecommunications system operable in accordance with the method as claimed in Claim 1.

7. (Amended) A time division duplex mobile telecommunications system operable in accordance with the method as claimed in Claim 1.

8. (Amended) A UMTS mobile telecommunications system operable in accordance with the method as claimed in Claim 1.

9. (Amended) A mobile terminal operable in accordance with Claim 1.

10. (Amended) A base station operable in accordance with Claim 1.

(Applicant's Remarks are set forth hereinbelow, starting on the following page.)

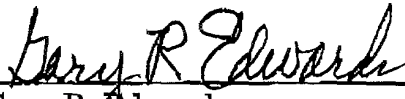
REMARKS

Entry of the amendments to the claims, as amended by way of Annexes to the International Preliminary Examination Report for PCT/GB00/02394, before examination of the application is respectfully requested. These claims have been amended to remove multiple dependencies.

If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket #3036/50648).

Respectfully submitted,



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**VERSION WITH MARKINGS TO SHOW CHANGES MADE
TO THE CLAIMS**

5. (Amended) A Code-Division Multiple Access mobile telecommunication system operable in accordance with the [methods] method as claimed in [any of Claims 1-4.] Claim 1.

6. (Amended) A code-Time Division Multiple Access mobile telecommunications system operable in accordance with the [methods] method as claimed in [any of Claims 1-4.] Claim 1.

7. (Amended) A time division duplex mobile telecommunications system operable in accordance with the [methods] method as claimed in [any of Claims 1-4.] Claim 1.

8. (Amended) A UMTS mobile telecommunications system operable in accordance with the [methods] method as claimed in [any of Claims 1-4.] Claim 1.

9. (Amended) A mobile terminal operable in accordance with [any one of Claims 1-4.] Claim 1.

10. (Amended) A base station operable in accordance with [any one of Claims 1-4.] Claim 1.

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JC05 Rec'd PC7/PTO 14 DEC 2001

IMPROVEMENTS IN OR RELATING TO MOBILE
TELECOMMUNICATIONS SYSTEMS

The present invention relates to improvements in or relating to mobile telecommunication systems, and is more particularly concerned with such systems operating on code-time division multiple access.

The UMTS terrestrial radio access (UTRA) - time division duplex (TDD) system is based on a combination of code division multiple access (CDMA) and hybrid time division multiple access (TDMA) which is known in the art as code-time division multiple access (CTDMA). (UMTS is an acronym for universal mobile telecommunication system also known by persons skilled in the art.)

In time division multiple access (TDMA), the time axis is divided into a plurality of time slots and users are permitted to transmit in certain ones of those time slots. Code division multiple access (CDMA), on the other hand, utilises direct sequence spread spectrum (DSSS) where a data is multiplied by a spreading factor (Q) prior to transmission in order to encode the data.

Current mobile telecommunications systems comprise a plurality of telecommunication cells each having at least one base station and at least one mobile terminal. Both the base station and the mobile terminal are capable of functioning as a transmitter and a receiver of radio frequency (RF) signals.

In a CTDMA system a number of users are permitted to transmit data sets during the same time slot. Each data set in a given time slot is separated by code division.

In order to receive transmissions in each time slot, the receiver must be able to estimate the characteristics of the transmission channel between the transmitter and receiver. In mobile telecommunications applications multipath distortion can arise and training sequences or some known data content is needed to facilitate channel estimation in the receiver. The information needed to estimate the transmission channel's characteristics is contained in the channel's impulse response, a term well known in the art. The training sequence may be referred to as a Training code, Midamble code, or Pilot code, all terms well known in the art. For the purposes of the following discussion of the prior art and disclosure of the present invention, the term Training code will be used when referring to the training sequence as defined above.

The Training code is required on both the uplink from mobile terminal to base station and the downlink from the base station to the mobile terminal in order that each transmission path to and from each user can be estimated.

A separate and distinct code from the Training code is the Channelisation code. The Channelisation codes are orthogonal codes taken from the set of Walsh codes and is a term well known in the art. The Channelisation code contains an index number and a spreading factor, both of which serve to encode the data prior to transmission. Thus the Channelisation code is also required during both uplink and downlink in order to interpret a user's data.

To enable multiple spreading factors to be applied to different user's data within the same time slot the Channelisation codes are assigned in a particular way. The preferred method of assigning Channelisation codes,

which is well known in the art, is the Orthogonal Variable Spreading Factor (OVSF) code relationship and is shown in the tree-link structure in Figure 1.

Currently during the downlink, a single Training code is transmitted along with all the data sets of the users in a given time slot. The receiver detects all these data sets along with the single Training code. This is known in the art as Joint Detection and it increases the probability of detecting the data set of interest to a particular mobile terminal user. Having received all the data sets the Receiver must know all the active Channelisation codes in order to insure it is able to interpret the data set of interest.

A problem with the current method is that if the receiver is configured to detect 8 Channelisation codes but only 2 data sets are active, the performance of system will be decreased. Similarly if the receiver is configured to detect 2 Channelisation codes but 6 data sets are active, the performance of the system will be decreased.

Currently, on the uplink of a dedicated channel the base station will know both the Channelisation code and the Training code as it assigns them. The base station communicates these to the mobile terminal in the prior downlink transmission.

However, on the uplink of channels that are not dedicated, for example when the mobile terminal is first switched on, there is often no signalling mechanism to assign Channelisation codes and the mobile terminal will pick at random a Channelisation code to transmit with. Under these circumstances a fixed relationship between the training and Channelisation code must be adopted.

It is therefore an object of the present invention to provide a method of associating a Training code to a Channelisation code in a mobile

telecommunications system such that upon detection of the Training code the Channelisation code is known.

According to the present invention there is provided a method of associating a Training code to a Channelisation code for use in a mobile telecommunication system comprising a base station and a mobile terminal, the method comprising the steps of selecting a Channelisation code, encoding data according to the Channelisation code, selecting a Training code based on a predetermined selection process, transmitting the Training code with the data, detecting the Training code and the data, and applying a set of rules to the Training code such that the Channelisation code is known, thereby facilitating interpretation of the data.

According to an aspect of the present invention, wherein the mobile telecommunications system is operating in an uplink mode, the steps include the mobile terminal selecting at random a Channelisation code from a plurality of available Channelisation codes, the predetermined selection process being such that the Training code selected for transmission to the base station is determined by the Channelisation code selected, and the set of rules applied to the Training code upon detection by the base station being such that for each Training code detected the Channelisation code used to encode the data received with that Training code is known.

According to a further aspect of the present invention, wherein the mobile telecommunications system is operating in a downlink mode, the steps include the base station assigning Training codes to users in a given time slot in a predetermined assignment sequence, the predetermined assignment sequence

having a spreading factor associated therewith, and the base station and the mobile terminal having knowledge of the predetermined assignment sequence and associated spreading factor such that upon detection of the Training code by the mobile terminal the Channelisation code used to encode the data is known.

The method according to the present invention may be used in a Code-Division Multiple Access mobile telecommunication system.

Alternatively, the method may be used in a Code-Time Division Multiple Access mobile telecommunications system.

Alternatively, the method may be used in a time division duplex mobile telecommunication system.

Alternatively, the method may be used in a UMTS mobile telecommunications system.

Advantageously, the present invention eliminates the need for explicit transmission of the Training code during uplink mode of operation of a mobile telecommunications system with dedicated channels.

Furthermore, in systems with non-dedicated channels where the mobile terminal selects the Channelisation code at random, the association of the Training code and the Channelisation code is fixed, thus making the detection of data possible.

Advantageously, the present invention improves the performance of a mobile telecommunications system by insuring that the receiver knows the number of Channelisation codes active in a given time slot.

While the principle advantages and features of the invention have been described above, a greater understanding and appreciation of the invention may be obtained by referring to the drawings and detailed

description of the preferred embodiment, presented by way of example only, in which;

Figure 1 is a diagram of the known Orthogonal Variable Spreading Factor Channelisation code relationship,

Figure 2 is a diagram, according to the present invention, of the association between Training code and Channelisation code for the Uplink Mode of Operation.

Figure 3 is a diagram, according to the present invention, of the association between Training code and Channelisation code for the Downlink Mode of Operation.

In Figure 1, a known method of depicting Channelisation codes of difference spreading factors is shown in the tree-like structure (10). The available Channelisation codes are denoted by $S_{k,Q}$, where k is the index number and Q is the spreading factor. According to this known method, in order for a Channelisation code to be assigned no other codes of a higher or lower spreading factor along the same branch of the tree on which the code lies can already be assigned.

For example, if $S_{0,4}$ is the code to be assigned, then $S_{0,8}$, $S_{1,8}$, $S_{0,2}$, and $S_{0,1}$ cannot already be assigned.

As was previously stated, both the transmitter and receiver need to know which Training code and which Channelisation code to use. The complexity of the relationship between the Training code and the Channelisation code will depend on whether the telecommunication system is operating in an downlink mode (base station to mobile terminal) or uplink mode (mobile terminal to base station), and are thus the two modes of operation will be treated separately.

In Figure 2, the association, according to the present invention, between the Training code and the Channelisation code for the uplink mode of operation is showing in tree-like structure (20). As in Figure 1, the available Channelisation codes are denoted by $S_{k,Q}$, where k is the index number and Q is the spreading factor. The available Training codes are denoted by m_j , where j is an integer indicating the maximum number of Training codes available for use in a given time slot. As will be appreciated by those skilled in the art, a plurality of Training codes and a plurality of Channelisation codes may be available.

The association, according to the present invention, between Training codes and Channelisation codes in an uplink mode of operation as shown in Figure 2 will be explained with reference to the following example.

In a preferred embodiment of the present invention a single spreading factor is always used. In the following example of a preferred embodiment of the present invention a spreading factor of 16 is always used. As will be appreciated by those skilled in the art other spreading factors may be used without departing from the scope of the present invention. When a user first switches the mobile terminal on he is operating in an uplink mode on a non dedicated channel. The mobile terminal will select at random a Channelisation code with a spreading factor of 16 in which to use during the first transmission to the base station. Both the base station and the mobile terminal know the association of the codes as shown in Figure 2. Thus once a Channelisation code with a spreading factor of 16 has been randomly selected, the Training code must be the one associated with it as per Figure 2. For example, if the Channelisation code $S_{6,16}$ has been selected, the Training code m_6 must also be used. The data is encoded according to the

Channelisation code $S_{6,16}$ and transmitted along with Training code m_6 . The base station then operates to detect the data and the Training code. Upon determining which Training code has been used, the base station will be able to determine which Channelisation code to use based on the association of codes shown in Figure 2. The base station will then be able to interpret the data.

During the downlink mode of operation, the requirements for code association are slightly more complicated. If the mobile terminal is to perform Joint Detection then it needs to know which are the active Channelisation codes and which codes are not active. It is not desirable for this information to be broadcast to all users because of the overhead required. Instead if different Training codes are assigned to each Channelisation code, then a user can easily detect which are the active codes by correlation with the known Training code, rather than attempting to measure the power in all possible codes. However the multiple spreading factors mean that there is a many to one relationship between the Channelisation code and Training code. Adopting a one to one relationship requires the user to correlate with more Training codes. However, if the relationship as shown in Figure 3 is adopted, together with additional rules governing the assignment of Channelisation codes, then the mobile terminal can determine the ambiguity between the Training code and the Channelisation code.

In Figure 3, the association, according to a further aspect of the present invention, between Training codes and Channelisation codes for the downlink mode of operation is shown in tree-like structure (30). The notation used in Figure 3 is the same as used in Figures 1 and 2.

An assignment sequence is used in conjunction with the rules of the OVSF tree shown in Figure 1, such that for a Channelisation code to be used, no other code with a spreading factor greater or smaller than the Channelisation code to be assigned can also be assigned along the same branch of the tree. A preferred assignment sequence for the association between Training code and Channelisation code is given below:

$$Q = 16: \{m_1, m_0, m_5, m_4, m_3, m_2, m_7, m_6\}$$

$$Q = 8: \{m_6, m_2, m_4, m_0\}$$

$$Q = 4: \{m_2, m_0\}$$

$$Q = 2: \{m_0\}$$

As will be appreciated by those skilled in the art alternative assignment sequences may be used without departing from the scope of the present invention.

Assignments for a particular spreading factor are made from left to right in the above sequences. Consequently, if the first Channelisation code uses Training code m_1 then subsequent use of Training code m_0 means that it must be associated with a spreading factor of 16, until Training code m_1 is relinquished. Similarly the use of Training code m_0 before Training code m_1 signifies that the spreading factor is 2. The assignment ordering above together with the rules of the OVSF tree means that Channelisation code can be determined, providing that the presence of the Training codes can be reliably detected.

The association, according to the present invention, between Training codes and Channelisation codes in an downlink mode of operation as shown in Figure 3 will be explained with reference to the following example.

After a user has switched on his mobile terminal and established contact with the base station, the base station will then assign that user a Channelisation code and a Training code. However, as will be appreciated by those skilled in the art, in a CDMA or CTDMA system, several users may be operating in the same time slot, all with their own unique Channelisation code and Training code as assigned by the base station. The base station will transmit simultaneously all the data of the users operating in that given time slot. According to an aspect of the present invention, the base station will only transmit a single Training code with each user's data. Furthermore, the base station will assign Training codes accordingly to the assignment sequence given above. Both the base station and the mobile terminal will know the association of the codes as shown in Figure 3 and the assignment sequence. The mobile terminal operating in Joint Detection will detect all the data and Training codes transmitted by the base station. Based on the order the Training codes are received, the mobile terminal will know which spreading factor has been used to encode the data. Knowing the Training code and the spreading factor allows the mobile terminal to determine the active Channelisation codes by reference to the association of codes shown in Figure 3.

For example, if the Training codes m_6 , m_2 , m_4 , and m_0 are detected by the mobile terminal, then based on the assignment sequence given above, the mobile terminal knows that the spreading factor is 8. Now by referring to association of codes shown in Figure 3, the mobile terminal will know that

the Channelisation code $S_{3,8}$, $S_{2,8}$, $S_{1,8}$, and $S_{0,8}$ are active in the time slot and thus be looking for 4 sets of data.

As is well known in the art the Training code is easier to detect because it has a fixed sequence.

As was previously stated, the performance for the system is enhanced when the receiver knows which Channelisation codes are active in a given time slot. The present invention provides a method for doing this.

As will be appreciated by those skilled in the art, the method of associating codes as per the present invention, can be used in a mobile telecommunication system operating in CDMA or CTDMA.

Furthermore, the method according to the present invention can be used in UMTS.

As will be appreciated by those skilled in the art, various modifications may be made to the embodiment hereinbefore described without departing from the scope of the present invention.

CLAIMS

1. A method of associating a Training code to a Channelisation code for use in a mobile telecommunication system comprising a base station and a mobile terminal, the method comprising the steps of:

- selecting a Channelisation code,
- encoding data according to the Channelisation code,
- selecting a Training code based on a predetermined selection process,
- transmitting the Training code with the data,
- detecting the Training code and the data, and
- applying a set of rules to the Training code such that the

Channelisation code is known, thereby facilitating interpretation of the data.

2. A method as claimed in Claim 1, wherein the mobile telecommunications system is operating in an uplink mode, and the steps include:

- the mobile terminal selecting at random a Channelisation code from a plurality of available Channelisation codes,

- the predetermined selection process being such that the Training code selected for transmission to the base station is determined by the Channelisation code selected, and

- the set of rules applied to the Training code upon detection by the base station being such that for each Training code detected the Channelisation code used to encode the data received with that Training code is known.

3. A method as claimed in Claim 2, wherein the spreading factor of the randomly selected Channelisation code is 16.

4. A method as claimed in any preceding Claim, wherein the mobile telecommunications system is operating in a downlink mode, and the steps include:

the base station assigning Training codes to users in a given time slot in a predetermined assignment sequence, the predetermined assignment sequence having a spreading factor associated therewith, and

the base station and the mobile terminal having knowledge of the predetermined assignment sequence and associated spreading factor such that upon detection of the Training code by the mobile terminal the Channelisation code used to encode the data is known.

5. A method as claimed in Claim 4, wherein the predetermined assignment sequence is:

for $Q = 16$: $\{m_1, m_0, m_5, m_4, m_3, m_2, m_7, m_6\}$

for $Q = 8$: $\{m_6, m_2, m_4, m_0\}$

for $Q = 4$: $\{m_2, m_0\}$

for $Q = 2$: $\{m_0\}$

where Q equals the spreading factor and m_j represents the available Training codes.

6. A Code-Division Multiple Access mobile telecommunication system using the method as claimed in any of Claims 1 - 5.

7. A Code-Time Division Multiple Access mobile telecommunications system using the method as claimed in any of Claims 1 -5.

8. A time division duplex mobile telecommunication system using the method as claimed in any of Claims 1 - 5.
9. A UMTS mobile telecommunications system using the method as claimed in any of Claims 1 - 5.
10. A method of associating a Training code to a Channelisation code as hereinbefore described with reference to the accompanying drawings.

IMPROVEMENTS IN OR RELATING TO MOBILE TELECOMMUNICATIONS SYSTEMS

ABSTRACT

A method of associating the Training code to a Channelisation code in a mobile telecommunications system. The method includes associating a Training code with a Channelisation code prior to transmission according to a set of rules such that upon detection of the Training code by a receiver, the Channelisation code is known.

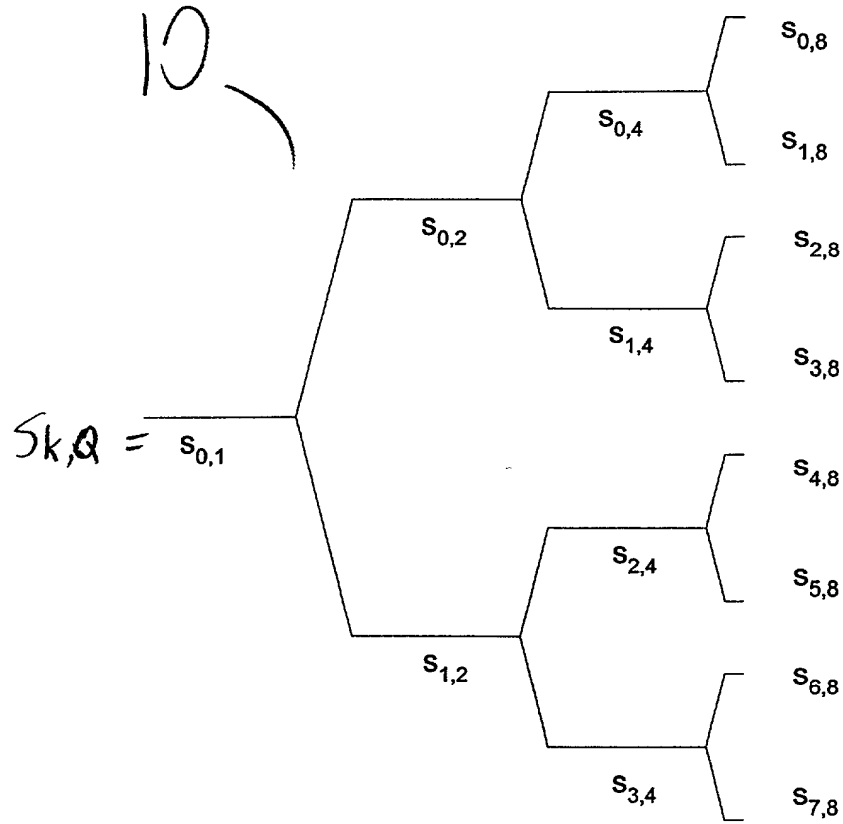


Figure 1 Orthogonal Variable Spreading Factor Channelisation Codes Relationship

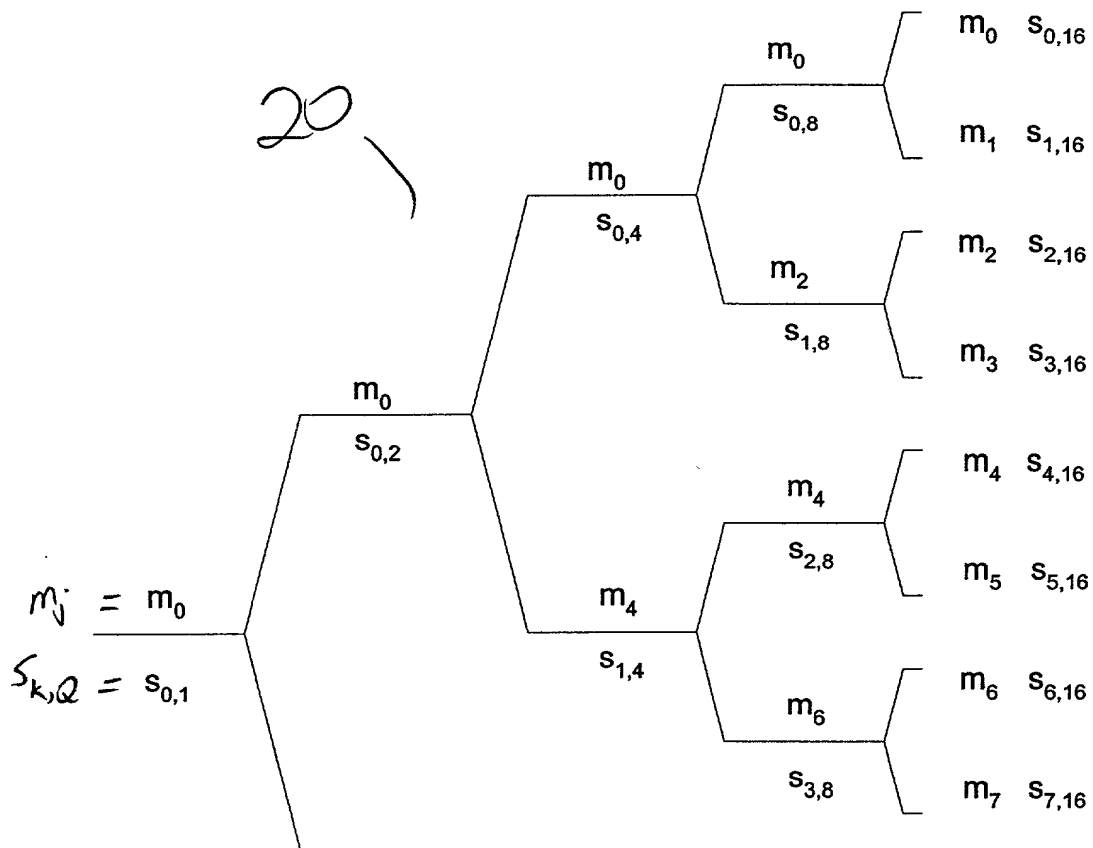


Figure 2 Association Between Training Code and Channelisation Code for the Uplink

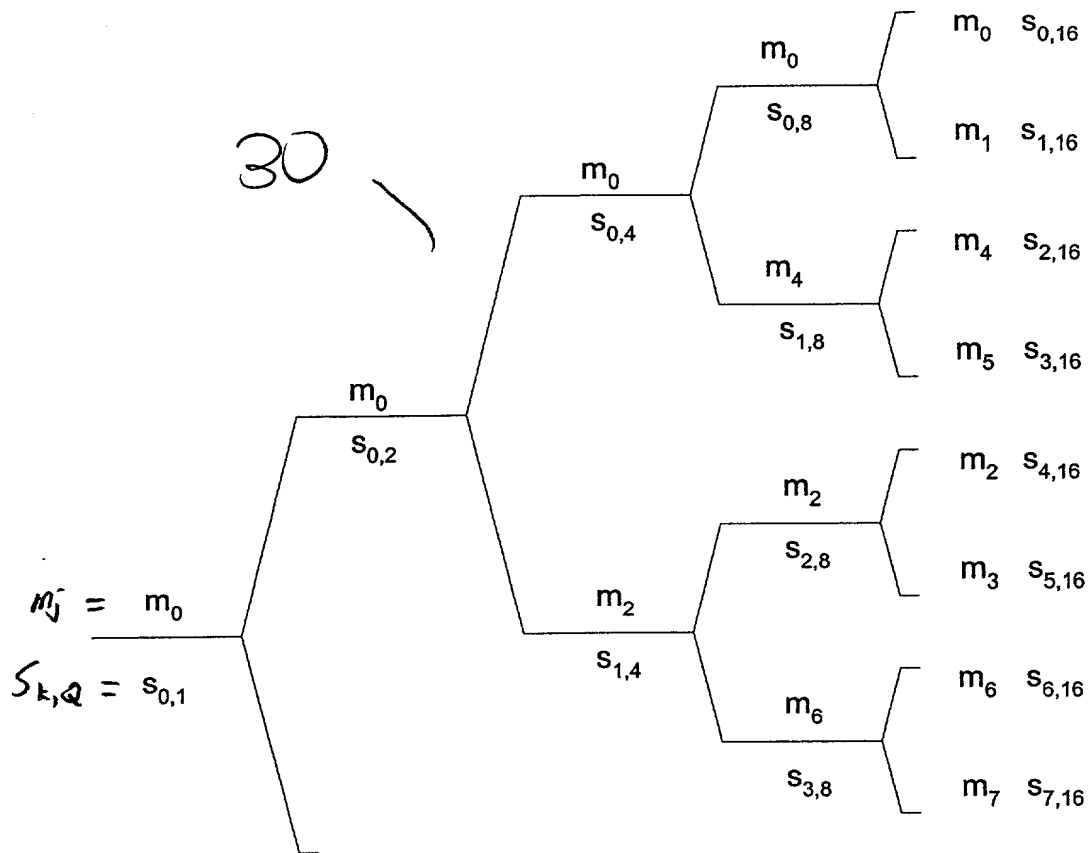


Figure 3 Association Between Training Code and Channelisation Code for the Downlink

**COMBINED DECLARATION FOR PATENT APPLICATION AND
POWER OF ATTORNEY**

(includes Reference to PCT International Applications).

ATTORNEY'S DOCKET NUMBER

3036/50648

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

IMPROVEMENTS IN OR RELATING TO MOBILE TELECOMMUNICATIONS SYSTEM

the specification of which (check only one item below):

- ☐ is attached hereto.
- ☐ was filed as United States application
Serial No. _____
on _____
And was amended
on _____ (if applicable).
- ☒ was filed as PCT international application
Number **PCT/GB00/02394**
on **19 June 2000**
and was amended under PCT Article 19
on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations. §1.56(a).

I hereby claim foreign priority benefits under Title 35, United State Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

| COUNTRY (if PCT indicate PCT) | APPLICATION NUMBER | DATE OF FILING (day, month, year) | PRIORITY CLAIMED UNDER 35 USC 119 |
|----------------------------------|--------------------|--------------------------------------|---|
| Great Britain | 9914858.7 | 25 June 1999 (25.06.1999) | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | | | <input type="checkbox"/> Yes <input type="checkbox"/> No |



I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national of PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120

| U.S. APPLICATIONS | | STATUS (Check one) | | |
|---------------------------------------|------------------|---------------------------------------|---------|-----------|
| U.S. APPLICATION NUMBER | U.S. FILING DATE | PATENTED | PENDING | ABANDONED |
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| PCT APPLICATIONS DESIGNATING THE U.S. | | | | |
| PCT APPLICATION NO | PCT FILING DATE | U.S. SERIAL NUMBERS ASSIGNED (IF ANY) | | |
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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (List name and registration number)

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| 203 | FULL NAME OF INVENTOR | FAMILY NAME | FIRST GIVEN NAME | SECOND GIVEN NAME |
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| | POST OFFICE ADDRESS | POST OFFICE ADDRESS | CITY | STATE & ZIP CODE/COUNTRY |

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true: and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

| | | |
|---|---------------------------|---------------------------|
| SIGNATURE OF INVENTOR 201 <u>J. S. Wales</u> | SIGNATURE OF INVENTOR 202 | SIGNATURE OF INVENTOR 203 |
| DATE <u>19/03/02</u> | Date | DATE |